THE NEXT BIG LEAP IN ADAPTIVE/ RECONFIGURABLE SYSTEMS

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ABSTRACT

Based on an innovative IC architecture, adaptive computing represents a new era in computing, one in which dynamic algorithms are mapped on to dynamic hardware resources, resulting in the most efficient use of silicon area at low cost. The technical differences and advantages of adaptive computing, as compared to conventional IC technologies (ASICs, DSPs, FPGAs) is dramatic.
By dynamically reallocating hardware both spatially and temporally, more processing power can be directed to specific problems as needed. Out of this powerful concept comes a new computing platform that combines the best of hardware and software into a powerful enabling technology for design and innovation.

As the desktop market moves to ever more mobile or portable environments, the demand for wireless capability dramatically increases, as do the requirements for a much wider variety of functions at high processing speeds, low power consumption, reduced silicon area, and low cost.

The driving trends for wireless are 3G and software defined radio (SDR), which will provide a better mobile device experience -- world phone capability, connectivity to data anywhere in the world, and advanced features, such as multimedia and digital imaging.

To meet these design imperatives, designers of next-generation mobile and wireless devices need a new computing platform that includes a highly flexible IC, a high-level language for efficient design, specific software tools, and an OS. The solution lies in adaptive computing, a new computing platform that empowers engineers with a complete design solution, and one that outpaces the performance of conventional, fixed-function IC technologies, such as ASICs, DSPs, FPGAs.

Rather than using different types of ICs, e.g. ASICs and DSPs that must be integrated once their designs are complete, adaptive computing utilizes a single piece of dynamically configured hardware that uses a unified tool flow, including a high-level programming language. The system design does not require compromises among ASIC, DSP, and RISC processor portions of the design and eliminates the tedious and inexact practice of dividing processing resources.

This paper will discuss:

- Why the time and market are right for a paradigm shift in computing.
- The evolution of reconfigurable computing to the higher level of adaptive computing -- an overview of the adaptive computing platform, including the value of a high-level language, specific tools, and OS.
- Dynamic software, dynamic hardware: Using silicon more efficiently to achieve small silicon area, architecture flexibility, high performance, low power consumption, and low cost.
- How this extreme level of processing performance and capability will provide greater functionality to computing environments
    - Adaptive computing has the performance of an ASIC, the speed of an ASIC, but is programmed by means of software – *dynamically configured at run time*
    - Micro and macro levels of adaptability
    - Full system scalability
    - Architecture flexibility for immediate bug fixes and updates in the field
- How this new platform will enable engineers to innovate, rapidly creating new solutions to processing and computing problems.
- The design flow for dynamically adaptive hardware -- and software that becomes hardware: From simulation to product – system partitioning, algorithmic categorization and programming, simulation model, test and verification, system integration at hardware and software levels.
- Supporting examples and visuals.